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## **SUMMARY OF PRECISION FARMING NITROGEN TRIALS IN MORE THAN 100 CORNFIELDS THIS YEAR**

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Research over the past decade has shown that precision farming technologies offer great potential to increase the profitability of corn production in Iowa. Producers who have invested in these technologies, however, are still trying to learn how to capture some of these profits. Experience clearly indicates that producers cannot increase their profits by using the new technologies merely to apply old management guidelines more precisely. Mounting evidence suggests that the great potential of precision farming technologies is realized only when the new technologies are used to develop better guidelines for management.

Our objective in this paper is to describe a novel program in which corn producers and researchers work together and utilize the new technologies to develop new guidelines for management of N during corn production. The studies are a continuation of research the Iowa Corn Promotion Board has funded for more than a decade. Studies in the 2001 cropping season were conducted in cooperation with the Iowa Soybean Association with funding from Iowa Soybean Promotion Board and Iowa Department of Agriculture and Land Stewardship.

### **Methods**

In 2001, more than 100 on-farm trials were established to evaluate nitrogen management practices currently used by producers. Each trial compared two treatments. The treatments were applied in alternating strips replicated at least five times. Each strip was the length of the field and at least two combine swaths wide. The strip width was determined by the size of N applicator, planter, and corn head on the combine. For example, a producer with a 6-row corn head, a 12-row planter, and a 12-row applicator would apply treatments in 12-row strips.

Soil samples were collected in late spring (i.e., when plants were 6 to 12 inches tall) at several sites within most trials to assess supplies of nitrogen for plant growth. Aerial photographs of the crop canopy were taken during the growing season to characterize spatial patterns in response to the N treatments. Stalk samples were collected at the end of the season to assess sufficiency of N for corn growth. Yields were measured by producers using combines equipped with yield monitors and GPS receivers.

Yield differences between adjacent strips were calculated and yield response maps were generated. These maps show spatial patterns in yield response and, therefore, showed where treatment differences occurred and where they did not.



## Description of Trials

Cooperating producers compared management practices of interest to them. The following is a list of trials, including the name of the trial (in quotations), followed by a brief description, objective, and rationale for each comparison.

“Manure +/-FN” Animal manure is applied uniformly across a field. No fertilizer N is applied until plants are at least 6 inches tall, and then fertilizer N is applied only in strips at a rate of 100 lb N/acre. In situations where losses of manure N are not expected, the extra N will be applied at 50 lb N/acre. Farmers must have the manure analyzed and have a good estimate of rate of manure application. Specific objectives include evaluating guidelines for nutrient management plans, demonstrating the value of manure as a fertilizer, refining the late-spring test’s ability to detect responsive sites, and identifying more efficient methods of manure application.

“75/125” This is for producers interested in exploring the potential of in-season fertilization for reducing rates of fertilization while increasing profits (corn after soybean only). No fertilizer N is applied before or at planting. When plants are 6 to 18 inches tall, fertilizer treatments of 75 and 125 lb N/acre are applied in alternating strips. The specific objective of this comparison is to test hypothesis that these rates tend to be equally profitable for producers across a wide range of conditions. Also tested will be the hypothesis that N fertilizer needs within this range are determined largely by prices for fertilizer and grain, antecedent weather, and soil organic matter content.

“-50/+50” This is for producers who normally apply all of their N in the spring before planting. Fertilizer N will be applied at a rate that is 50 lb N/acre less than normally applied by producers. After the crop has emerged, an additional 50 lb N/acre fertilizer will be applied in strips. The specific objective is to show exactly where and when rates of fertilization can be reduced. Pooling data from many sites will help to compare the efficiency of alternative application methods.

“Broadcast UAN +/-50” This is for producers who normally apply all their N by broadcasting UAN solutions on the soil surface. An extra 50 lb N is applied in strips after the crop has emerged. The specific objective is to learn when and where broadcasting UAN on the surface (without incorporation) is safe and where it is not. Efforts to refine techniques for using reference strips and remote sensing to guide rescue fertilization are considered important in this comparison.

“Solid urea +/- 50” This is for producers who apply solid urea before planting. An extra 50 lb N/acre will be applied in strips after plants have emerged. In situations where urea was applied in the winter an extra 100 lb N/acre is applied. The specific objective is to learn when surface applications of urea are advisable and when they are not.



“+/- N-Serve” This is for any producer interested in assessing the benefits of N-Serve. Fertilizer is applied with and without N-Serve in alternating strips. The specific objective is to learn where use of N-Serve benefits producers and where it does not.

“Fall N +/- 50” This is for producers who apply N in the fall. The study involves applying an extra 50 lb N/acre in strips after plants are 6 inches tall. A specific objective is to learn where fall applications of N are safe and where they are not. Another specific objective is to refine techniques for using reference strips and remote sensing to guide rescue fertilization.

“Dribble/injected” This is for producers interested in exploring the potential benefits of in-season fertilization. No fertilizer is applied until after plants have emerged. UAN solution is applied at 100 lb N/acre, but injected and dribbled are compared in alternating strips. The specific objective is to evaluate the possibility that UAN dribbled (with appropriate precautions) is desirable due to application ease.

### **Data analysis and Reporting**

Most cooperating producers received aerial images of their fields during the growing season. These aerial photographs give good estimates of the results of the trials. Analyses based on these images suggest that results observed in 2001 are similar to results of similar studies in the past.

Researchers currently are analyzing data from individual fields and summarizing the results. Cooperating producers will receive more detailed results from their fields at group meetings during January and February 2002. A key component of these meetings is that cooperating producers will have an opportunity to share and discuss data collected within their portion of the state. Overall summaries of the results obtained will be released as appropriate. All data will be used to develop or refine management guidelines for all producers in Iowa.

### **Conclusion**

Precision farming technologies make it practical for producers to evaluate and improve N management practices on their fields. Organized groups of producers using these technologies have unprecedented capacity to generate the large amounts of data needed to optimize N management practices on their fields. The information gathered will provide the greatest benefits to producers utilizing the new technologies, but it will also provide substantial benefits to producers who do not use the new technology.